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DOI:

[10.1111/add.14527](https://doi.org/10.1111/add.14527)

Document Version

Peer reviewed version

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Citation for published version (APA):

Gravelly, S., Thrasher, J. F., Cummings, K. M., Ouimet, J., McNeill, A., Meng, G., Lindblom, E. N., Loewen, R., O'Connor, R. J., Thompson, M. E., Hitchman, S. C., Hammond, D., Heckman, B. W., Borland, R., Yong, H. H., Elton-Marshall, T., Bansal-Travers, M., Gartner, C., & Fong, G. T. (2019). Discussions between health professionals and smokers about nicotine vaping products: results from the 2016 ITC Four Country Smoking and Vaping Survey. *Addiction*, 114(S1), 71-85. <https://doi.org/10.1111/add.14527>

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Discussions between health professionals and smokers about nicotine vaping products: results from the 2016 ITC Four Country Smoking and Vaping Survey

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Keywords: E-cigarettes, health professionals, nicotine vaping products, policy, regulation, smokers.

Abstract

Background and Aims: Debate exists about whether health professionals (HPs) should advise smokers to use nicotine vaping products (NVPs) to quit smoking. The objectives were to examine in four countries: (1) the prevalence of HP discussions and recommendations to use an NVP; (2) who initiated NVP discussions; (3) the type of HP advice received about NVPs; and (4) smoker's characteristics related to receiving advice about NVPs.

Design: Cross-sectional study using multivariable logistic regression analyses on weighted data from the 2016 ITC Four Country Smoking and Vaping Survey (ITC 4CV1).

Setting: Four countries with varying regulations governing the sale and marketing of NVPs: 'most restrictive' (Australia), 'restrictive' (Canada) or 'less restrictive' (England and United States).

Participants: A total of 6615 adult smokers who reported having visited an HP in the last year (drawn from the total sample of 12 294 4CV1 respondents, of whom 9398 reported smoking cigarettes daily or weekly). Respondents were from the United States ($n = 1518$), England ($n = 2116$), Australia ($n = 1046$), and Canada ($n = 1935$).

Measurements: Participants' survey responses indicated if they were current daily or weekly smokers and had visited an HP in the past year. Among those participants, further questions asked participants to report (1) whether NVPs were discussed, (2) who raised the topic, (3) advice received on use of NVPs and (4) advice received on quitting smoking.

Findings: Among the 6615 smokers who visited an HP in the last year, 6.8% reported discussing

NVPs with an HP and 2.1% of smokers were encouraged to use an NVP (36.1% of those who had a discussion). Compared with Australia (4.3%), discussing NVPs with an HP was more likely in the United States [8.8%, odds ratio (OR) = 2.15, 95% confidence interval (CI) = 1.41–3.29] and Canada (7.8%, OR = 1.87, 95% CI = 1.26–2.78). Smokers in Australia were less likely to discuss NVPs than smokers in England (6.2%), although this was not statistically significant (OR = 1.47, 95% CI = 0.98–2.20). Overall, the prevalence of HPs recommending NVPs was three times more likely in the United States than in Australia (OR = 3.07, 95% CI = 1.45–6.47), and twice as likely in Canada (OR = 2.28, 95% CI = 1.06–4.87) than in Australia. Australia and England did not differ (OR = 1.76, 95% CI = 0.83–3.74). Just over half (54%) of respondents brought up NVPs themselves; there were no significant differences among countries.

Conclusions: Discussions in Australia, Canada, England, and the United States between smokers and health professionals about nicotine vaping products appear to be infrequent, regardless of the regulatory environment. A low percentage of health professionals recommended vaping products. This was particularly evident in Australia, which has the most restrictive regulatory environment of the four countries studied.

Introduction

The current evidence on the effectiveness of nicotine vaping products (NVPs) (e.g. e-cigarettes) for smoking cessation is limited [1–3]. Much of the difficulty in establishing a benefit for NVPs has do with the dearth of randomized control trials demonstrating a benefit for NVPs as cessation aids [4]. While scientists, clinicians and public health organizations have engaged in extensive debate about the uncertainty of the possible risks and benefits of NVPs, several governments have adopted diverse regulatory approaches [5]. As of 2018, vaping products (with or without nicotine) have been banned in 27 countries, nine countries have banned the sale of NVPs, and 36 countries permit the sale of NVPs with diverse regulations (e.g. minimum age of purchase, advertising and promotion, packaging, product regulation, taxes, etc.) [6].

Regardless of national (or jurisdictional) legal frameworks of NVPs, they are now a popular method for cessation, surpassing other approved cessation aids such as licensed nicotine replacement therapy (NRT) and prescription medications in many countries, including the United Kingdom, the United States and Canada [7–9]. In 2014, an estimated 6.1 million people quit smoking with the help of an NVP in the European Union (EU) [10], and 1.5 million adults in Great Britain have stopped smoking cigarettes with the help of NVPs [11]. Evidence shows, however, that patterns of NVP use are probably influenced by a country's regulatory environment [12–14]. In countries where NVPs are banned (and enforcement is strong), current use of NVPs is generally low [14]. Although NVPs represent a new paradigm for smoking cessation by offering smokers nicotine in a way that does not require inhaling combusted tobacco smoke, it is unclear how the legal status of NVPs may affect discussions with a health professional (HP) in a clinical context.

The majority of research on HP–smoker discussions about NVPs comes from cross-sectional and qualitative surveys of physicians. These studies have indicated that dialogues about NVPs have become increasingly frequent in clinical settings [15–19], are generally initiated by the patient [16,20,21], and typically do not end in a recommendation to use NVPs, apparently because most providers remain neutral or advise against use [20,22–27]. To the best of our knowledge, only two studies have examined patient–physician NVP discussions from the patient’s perspective [28,29]. One online study in the United States by Berg *et al.* (2015) found that approximately a quarter (27%) of smokers reported having ever talked with their physician about NVPs. Among those who had had a discussion, 66% reported that their physician recommended NVPs (18% of all 918 smokers) [28]. The second online study from the United States by Kollath-Cattano *et al.* (2016) found that 15% of smokers who saw a physician in the prior year reported discussing NVPs with them [29]. Of those who spoke with their physician about NVPs, 61% (10% of all 2671 smokers) reported that their physician recommended NVPs to help them quit smoking. These studies, therefore, suggest that NVP discussions in clinical encounters are not as frequent as physician reports may suggest. Neither of these studies, nor those surveying physicians, have considered how regulations on the sale and use of NVPs could affect the advice given to smokers.

Physicians and other HPs (e.g. smoking cessation counsellors, nurses, pharmacists) are accessible and reliable sources of support for smoking cessation, and smokers often cite a physician’s advice as an important motivator to quit [30,31]. Globally, clinical practice guidelines strongly encourage all HPs to identify smokers and offer help to quit. Evidence, mainly from the United States, suggests that as conversations about NVPs have increased in the

clinical context [15–18], therefore HPs should be prepared to provide a balanced discussion about the possibility of using NVPs for smoking cessation. This may be particularly relevant for smokers who are seeking advice about NVPs, wanting to try/or already using NVPs to quit smoking, or failing repeatedly to quit with medically approved cessation methods [3,4,32,33]. For example, recently released National Institute for Health and Care Excellence (NICE) guidance in England has recommended that practitioners should give advice to allow an informed discussion on using NVPs as a means to quit smoking [34], as they are less harmful than combustible cigarettes [35]. However, as clinical practice guidelines in other countries do not include such recommendations, HPs may be more hesitant to recommend NVPs to smokers. For example, a recent study in the United States found that 50% of 115 surveyed physicians reported that although NVPs were a viable harm reduction tool, 51% also stated that an absence of regulatory controls by the Food and Drug Administration (FDA) was a major concern for them [22].

The present study used a large, representative sample of smokers from multiple countries with varying regulations governing NVP sales, marketing, possession and use (United States, Canada, England and Australia: see Supporting information, Fig. 1) to provide estimates of: (1) HP discussions and recommendations for smokers to use an NVP; (2) who initiated NVP discussions (HP versus smoking respondent); (3) the type of HP advice received about NVPs; and (4) receiving any advice to quit smoking. This study also tested if there were differences in estimates throughout the four countries, given that they vary in NVP regulatory policies and enforcement. In countries such as Canada and Australia, where nicotine-containing NVPs were prohibited to be sold at the time of data collection (possession and use of NVPs without a

medical prescription was also prohibited in Australia), HPs may have been less likely to advise smokers to use them. Finally, this study also examined smoker's characteristics related to discussing and receiving advice to use NVPs.

Methods

Sample and procedure

The International Tobacco Control Four Country Smoking and Vaping Survey Wave 1 (ITC 4CV1) Survey [36] is an expansion of the 2002–15 ITC Four Country (ITC 4C) Survey [37]. In brief, the ITC 4CV1 Survey consisted of four parallel surveys conducted in Canada, the United States, England and Australia, and included adults (aged 18+) who reported to be: currently smoking cigarettes (daily, weekly, monthly or less than monthly, but occasionally), currently using an NVP (at least weekly) or a former smoker (quit ≤ 2 years). The sample in each country was designed to be as representative as possible of cigarette smokers and NVP users (e.g. by age and sex), and consisted of re-contacted respondents from the ITC 4C cohort and new respondents from online panels (using either probability-based sampling frames or non-probability opt-in panels, or a combination of these). The survey was completed in English (or French when requested in Canada) and took an average of 50 minutes. Data collection occurred between July and November 2016. Detailed descriptions of the methods used in each country are presented in the ITC 4C and 4CV1 technical reports [36,37], and in the Thompson *et al.* 4CV1 methods paper [38].

For the current study, respondents were eligible for inclusion if they: (1) were current daily or weekly smokers; and (2) had visited an HP in the last year. Monthly or occasional

smokers ($n = 1,369$) and former smokers ($n = 1,453$) were not included, as discussions about NVPs would not be comparable to smokers who are more addicted to nicotine.

Measures

Demographics, smoking, NVP and health-related variables

Socio-demographics. Country of residence (used as a proxy for NVP regulatory policy environment), sex (male or female), age group (18–24, 25–39, 40–54 or 55+ years), educational attainment (low, moderate, high) and annual household family income (low, moderate, high).

Smoking variables. Respondents were classified as a current daily smoker or a current weekly smoker at the time of the survey. Other smoking-related variables included: perceived addiction to cigarettes (a little/a lot versus not at all/don't know), ever tried to quit smoking (yes or no), tried to quit smoking in the last year (yes or no) and intentions to quit smoking (in the next month/within 6 months versus sometime beyond 6 months/not at all/don't know).

NVP variables. Measures related to NVPs included: e-cigarette/vaping device use (daily/weekly/occasionally versus not at all/never tried/don't know), e-cigarettes/vaping make quitting smoking easier or harder (yes easier versus no effect/harder versus don't know), opinion of e-cigarettes/vaping (positive versus no opinion/negative versus don't know), relative harm of e-cigarettes/vaping compared to conventional cigarettes/smoking (less harmful versus equally harmful/more harmful versus don't know), e-cigarettes/vaping can improve health (would improve health versus no effect/worse/don't know) and public opinion of e-cigarettes/vaping (public approves versus neither/disapproves versus don't know).

Health variables. Self-reported health and mental health conditions included: depression, anxiety, diabetes, chronic lung disease (emphysema, chronic bronchitis or asthma)

or cancer (all: yes or no).

Outcome variables

Discussion with an HP about NVPs. Respondents were asked: ‘On any visit to a doctor or health professional in the last 12 months, did the doctor or health professional talk to you about e-cigarettes?’ Response options: Yes, no, or don’t know.

Who brought up the discussion about NVPs. Respondents who reported that they had talked to an HP about NVPs were asked: ‘The last time you discussed e-cigarettes with a doctor or health professional, did you bring it up or did they?’ Response options: I brought it up, the doctor or health professional brought it up, or don’t know.

Advice about NVPs by the HP. Respondents reporting that they had talked to an HP about NVPs were asked: ‘What advice did the doctor or health professional give you about e-cigarettes?’ Response options: they specifically recommended that I use e-cigarettes, they advised me against using e-cigarettes, they didn’t express a view for or against e-cigarettes or don’t know.

Received advice by HP to quit smoking. This was assessed by: ‘On any visit to a doctor or health professional in the last 12 months, did you receive any advice to quit smoking?’

Response options: Yes, no or don’t know.

Specific questions and original response options can be found in the ITC 4CV1 Survey [39]. All study procedures were approved by the ethics research committee at the University of Waterloo (Ontario, Canada), and ethics committees in the US (Medical University of South Carolina), England (King’s College London) and Australia (Cancer Council Victoria).

Statistical analysis

Initially, unweighted descriptive statistics of the respondents by country and for the total sample were computed.

Next, cross-sectional weighted estimates were computed for each of the outcomes: (1) prevalence of discussions with an HP about NVPs; (2) prevalence of NVP recommendation by an HP; (3) who initiated the conversation (HP versus smoker; conditional on having a discussion about NVPs); (4) the type of advice received by an HP (conditional on having a discussion about NVPs); and (5) advice (yes versus no) received about smoking cessation by the HP.

[Figure 1 about here]

Analyses were conducted with separate logistic regressions for each outcome. All regression models adjusted for sex, age, smoking status and country. Overall (weighted) estimates were presented first, and then country (mean) comparisons were made using Australia as the reference country (because it had the strongest NVP regulatory policies, with enforcement at the time of the survey). Respondents who refused to answer a question related to the outcome variable(s) of interest were excluded from logistic regression analyses (see Fig. 1).

For the outcome ‘advice about NVPs by the HP’, within-country ratios were computed to determine the proportion of: (1) HPs who recommended NVPs divided by HPs who advised against NVPs; and (2) HPs who provided advice for or against NVP use (i.e. formed an opinion) divided by HPs with no recommendation either for or against NVPs (i.e. remained neutral).

Finally, two adjusted binary logistic regression models were estimated to examine which respondent characteristics were independently associated with: (1) having a discussion about

NVPs (model 1a: yes versus no); and (2) receiving a recommendation to use NVPs (model 1b: yes versus no/neutral). All the demographic, smoking, NVP and health variables (described above) were included in each model, and are presented in Table 3. Respondents with any missing data were removed by listwise deletion from the regression analyses.

The stratified sampling design (defined by geographic regions within each country) was incorporated in all logistic models to address potential design effects. All confidence intervals and statistical significance were tested at the 95% confidence level. Analyses were conducted using SAS version 9.4.

Results

Respondents

Of the 12 294 respondents in the overall main ITC 4CV1 sample, 9398 respondents reported smoking cigarettes either daily or weekly at the time of the survey. Among these smokers, 6615 (70.9%) had visited an HP in the last year, and were therefore eligible for the current study; 2783 smokers were excluded because they: (i) did not know if they had visited an HP in the last year ($n = 53$); (ii) refused to answer this question ($n = 17$); or (iii) had not visited an HP in the last year ($n = 2713$). A study inclusion flow-chart is presented in Fig. 1.

Overall, the sample was on average aged 45.4 years, 51.8% female and the majority (87.8%) were daily cigarette smokers. Table 1 presents the unweighted study sample characteristics.

Prevalence of HP discussions and advice about NVPs

Among all smokers who saw an HP in the last year, 6.8% reported discussing NVPs with an HP

and 2.1% of smokers reported that an HP recommended that they use an NVP (Table 2a).

Content of NVP discussions with an HP

Among those who discussed NVPs with their HP ($n = 833$), 54.0% of smokers reported that they brought up the topic and 45.0% reported that their HP did (1.0% did not know/remember).

Additionally, 36.1% of those who discussed NVPs reported their HP recommended use, 22.1% reported being advised against use and 40.4% said their HP remained neutral. Overall, smokers from all four countries who reported NVP discussions with their HP were on average more likely to report receiving a recommendation to use an NVP compared to a recommendation against its use (overall ratio: 1.63; Table 2b).

[Tables 1 and 2a about here]

Advice about smoking cessation

Of those who had visited an HP in the last year and completed the survey question about whether they were given smoking cessation advice by an HP ($n = 6540$), 47.5% reported receiving advice about quitting smoking from the HP. Receiving advice to quit from an HP was most common in the United States (58.3%) and least common in England (39.5%) (see Table 2a). Among the smokers who received advice to quit ($n = 3317$), 12.3% discussed NVPs with an HP. Among those who had had a discussion about smoking cessation ($n = 724$), 37.8% received advice to use an NVP, 20.9% of smokers were advised against NVP use and 41.3% of HPs remained neutral.

Country comparisons

Prevalence estimates of NVP discussions and recommendations. Compared to Australia (4.3%), discussing NVPs with an HP was more likely in the United States [8.8%, odds ratio (OR) = 2.15,

95% confidence interval (CI) = 1.41–3.29] and Canada (7.8%, OR = 1.87, 95% CI = 1.26–2.78).

Australia also had a lower proportion of smokers discussing NVPs than in England (6.2%), although this was not statistically significant (OR = 1.47, 95% CI = 0.98–2.20).

[Tables 2b and 3 about here]

Overall, the prevalence of HPs recommending NVPs was three times more likely in the United States (OR = 3.07, 95% CI = 1.45–6.47) than in Australia, and twice as likely in Canada (OR = 2.28, 95% CI = 1.06–4.87) than in Australia. There was no significant difference between Australia and England (OR = 1.76, 95% CI = 0.83–3.74).

Content of discussions. Among those who had discussed NVPs with an HP in the last year ($n = 833$), a higher proportion of smokers in the United States (50.1%) and England (47.2%) reported that their HPs initiated the discussion about NVPs than in Canada (40.4%) and Australia (39.9%), although these comparisons were not statistically significant. Recommendations by HPs to use NVPs was highest in the United States (40.0%) and lowest in Australia (28.7%), but again there were no significant differences between countries. The United States (33.0%) and Australia (32.7%) also had the highest proportion of HPs advising against NVP use, whereas Canada had the lowest (14%), with England in between (20.6%). Canadian HPs (50.1%) were significantly more likely to remain neutral (OR = 2.36, 95% CI = 1.20–4.63) compared to HPs in the United States (25.3%). There were no other significant differences between countries (see Fig. 2).

Among smokers who had received HP advice to quit smoking in the last year and had had a discussion about NVPs ($n = 715$), there were no differences between the countries for the positive recommendation to use one; however, Canadian smokers were less likely than

American (OR = 0.27; 95% CI = 0.12–0.63) and Australian (OR = 0.33, 95% CI = 0.12–0.95) smokers to be advised against using an NVP by an HP. Canadian HPs were also significantly more likely to remain neutral compared to American (OR = 3.68, 95% CI = 1.58–8.60) and Australian (OR = 3.01, 95% CI = 1.049–8.637) HPs.

Within-country ratio comparisons among smokers who had had a discussion with an HP about NVPs

HP favorable NVP opinion ratio: recommend NVPs versus advised against use of NVPs. As shown in Table 2b, more smokers reported that their HP recommended NVPs as opposed to advising against using them in Canada (2.41), the United States (1.21) and England (1.67); but in Australia, HPs more often advised against using NVPs (as opposed to advising smokers to use them: ratio: 0.88).

HP opinion provided (recommend versus not recommend) versus no opinion (no advice provided). As shown in Table 2b, HPs were reported to have provided advice about NVPs (either recommended smokers to use them or advised against use) as opposed to remaining neutral in Australia (1.6), England (1.24) and the United States (2.89), whereas a greater proportion of Canadian HPs were reported to have remained neutral as opposed to providing any specific advice about using an NVP (0.95).

Smoker characteristics associated with a discussion and advice about NVPs

Two adjusted logistic regression models estimating the association between smoker's characteristics and discussing NVPs with an HP and recommendation received are presented in Table 3. Overall, discussions and NVP recommendations were more common among smokers who were: from the United States, Canada or England (compared to Australia), younger, more

highly educated, more frequent NVP users, and more positive about NVPs. Both discussions about, and recommendations to use NVPs were significantly associated with having received advice by an HP in the last year to quit smoking, and with smokers who believed that the public approved of NVPs/vaping.

Discussion

Although several studies that have surveyed HPs (particularly physician samples) have indicated that dialogues about NVPs have become increasingly frequent in clinical settings, findings from our study suggest that these discussions in the clinical encounter are not as frequent as HP reports have suggested. This is in line with the previous studies that examined NVP discussions with samples of smokers [28,29]. Our findings showed that, overall, fewer than 10% of smokers reported having a discussion about NVPs with an HP in the last year. Moreover, a number of studies have shown that HPs are divided about recommending NVPs for smoking cessation [15,19,20,22,26,32]. The results herein have shown that HPs rarely recommended NVPs to smokers (only 2% of smokers were encouraged to use an NVP, which was approximately a third among those who had a conversation about the topic). Our findings also showed that just over half of the reported discussions about NVPs were initiated by the smokers themselves, and not by the HP, which may indicate that HPs do not feel entirely comfortable or confident bringing up the topic. This has also been found in other studies, where reasons for not advising about NVPs have included the HP's perceived uncertainty about the safety and efficacy of NVPs [23,24,40], negative beliefs [20,23–26], lack of knowledge [15,22–25,41], and lack of confidence in their own capacity to counsel smokers about NVPs [42]. These cited studies, however, have mainly been conducted in the United States using convenience samples, with limited data on

common practices in other countries.

Our study suggests that one of the key reasons why HPs appear hesitant to discuss and recommend NVPs is the regulatory environment in which they practice. This was particularly evident in our results regarding Australia, where the sale of NVPs is prohibited, and the law is enforced. Indeed, fewer Australian smokers reported that an HP had discussed and recommended NVPs than smokers in the other three countries. Notably, previous evidence has shown that patterns of NVP use by smokers is also likely to be influenced by national NVP policies and the strength of these regulations [12–14]. The study by Gravely *et al.* (2019) showed that Australian smokers (and former smokers) had lower rates of NVP use compared to other high-income countries, and that the prevalence of NVP use was higher among countries where NVPs were widely available for sale, and more commonly used for smoking cessation [14].

In Canada, a much larger proportion of HPs remained neutral, and did not provide a recommendation in favor for or against using an NVP. At the time of the 2016 survey, NVPs were not approved for sale, but they were widely available in specialty retail vape shops. In November 2016, the Canadian government announced plans to regulate NVPs under the Tobacco Act, which would make vaping devices with nicotine legal to sell and purchase (this has been in effect since May 2018). This may have been a source of confusion for HPs about the role of NVPs for smoking cessation, especially as Canadian clinical practice guidelines do not currently recommend NVPs as a quit aid (even though NVPs are the most popular quit assist method reported by smokers in Canada [9]). Therefore, HP advice in Australia and Canada was probably strongly influenced by national regulatory policies, the absence of NVP

recommendation in clinical guidelines, the level of availability of NVPs on the open market, and the relative popularity of NVPs among smokers.

One interesting finding in this study was that smokers in England did not report a higher proportion of NVP discussions or recommendations. This is striking, given that at the time of the survey, the Royal College of Physicians (RCP) of London, England [43] and Public Health England (PHE) [44] strongly supported the notion that NVPs should be widely promoted as a substitute for smoking. PHE published a joint-position statement in July 2016 with other UK public health organizations supporting NVPs as a cessation tool (or at least that HPs should encourage smokers to completely switch to NVPs) [45]. The unexpectedly low level of discussions of NVPs with HPs in England may be partly explained by the positions of the British Medical Association [46] and the World Health Organization (WHO) [47], which have not actively supported NVPs to be used for cessation in the absence of strong data about their safety and efficacy. A 2016 report by the WHO stated that there is not enough research to quantify the relative risk of NVPs over combustible products [47], and WHO has previously urged countries to restrict the sale, promotion and use of electronic cigarettes [48].

Additionally, some recent reviews have also demonstrated the inconclusive evidence about the health risks associated with NVPs use [49–51]. Therefore, our data may be indicating that HPs in England (and in the other countries) may be conflicted about the role of NVPs in smoking cessation due to the opposing positions of various NGO and public health organizations.

Another explanation may be that smokers in England are turning to sources other than an HP for advice about NVPs, such as online sources (e.g. product websites, social media etc.), retail shops, friends, or NVP packaging instructional pamphlets. This should be further explored.

In addition to the country effects found in this paper, the results also showed that NVP discussions and recommendations were more common among smokers who were: younger, more highly educated, advised to quit smoking at the time of their HP visit, more frequent NVP users, more positive about NVPs, and more likely to perceive that the public approved of NVPs. Similar to other studies that have shown that physicians were more likely to recommend NVPs if they normally assess the smoking status of their patients [18,21], HPs in this study were also more likely to discuss and recommend NVPs to smokers if the respondents reported that they had received advice about quitting smoking in the last year. Some research has shown that patient's questions about NVPs do not always directly relate to smoking cessation specifically, and can more generally be about the harm and safety of NVPs (including side effects, nicotine health risks and addiction issues). For example, one online study of licensed HPs from various disciplines found that half of providers reported having discussed vaping as a harm reduction option, while 26% discussed vaping as a quit aid [19]. Our study suggests that HPs who are offering direct smoking cessation advice to their patients (and perhaps more regularly assess smoking status and cessation) may be more willing to recommend NVPs as a quit smoking aid. Additionally, other studies have shown that NVPs are more frequently used among those who are younger and have a higher education and income [7,52–54]; therefore, HPs may be tailoring their discussions and advice about NVPs based on the smoker's demographic profile (e.g. to those who may be more willing to try them).

While this cross-sectional study has many strengths (e.g. a large population-based sample of smokers from four countries), the results should be interpreted with caution, owing mainly to issues of temporality and recall bias. For example, smoker's perceptions and beliefs

about NVPs at the time of the survey may not have been the same when they visited their HP. Similarly, we are unable to determine if HP advice to use NVPs was associated with resultant vaping initiation as a method to stop smoking. Furthermore, the findings probably underestimate the life-time prevalence of discussions between an HP and smokers, as the time-frame for reporting NVP discussions was limited to the prior year (in order to reduce recall bias). Finally, the lack of significant findings for some analyses may be due to statistical power issues resulting from low prevalence of some key outcomes (i.e. discussions of NVPs with a HP was < 10% of the initial sample).

Conclusions

Despite the need for more evidence on their efficacy and long-term safety, NVPs are now a more popular method for cessation than licensed NRT and prescription stop-smoking medications in many countries [7–9]. In light of this, HPs should be prepared to provide balanced information about NVPs, particularly to smokers who are unable to stop smoking with approved cessation therapies, and for those who are requesting guidance regarding NVPs as a smoking cessation aid [4]. Overall, the results from this study have shown that discussions between smokers and HPs about both quitting smoking, and the possible role NVPs could play as a cessation aid, were infrequent in the four countries in 2016. This may represent a lost opportunity for encouraging quitting smoking by providing a potentially attractive option to help smokers to quit. Some country differences were evident, particularly in Australia, which has the strictest regulatory environment, and where HPs were less likely to discuss and endorse NVPs.

Declaration of interests

K.M.C. has received payment as a consultant to Pfizer, Inc., for service on an external advisory panel to assess ways to improve smoking cessation delivery in health care settings.

K.M.C. also has served as paid expert witness in litigation filed against the tobacco industry.

D.H., J.F.T. and G.T.F. have served as expert witnesses on behalf of governments in litigation involving the cigarette industry. All other authors have no conflicts of interest to declare.

Acknowledgements

This study was supported by grants from the National Cancer Institute of the US

(P01CA200512), the Canadian Institutes of Health Research (FDN 148477) and by the National

Health and Medical Research Council of Australia (APP1106451). S.G. was funded by a 3-year

Canadian Cancer Society (CCS) Career Development Award in Cancer Prevention (703858).

G.T.F. was supported by a Senior Investigator Award from the Ontario Institute for Cancer

Research. B.W.H. was supported by NIDA (K23 DA041616). The sponsors had no role in the

design and conduct of the study; collection, management, analysis and interpretation of the

data; preparation, review or approval of the manuscript; and decision to submit for publication.

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Figure 1. Study Inclusion Flow Diagram

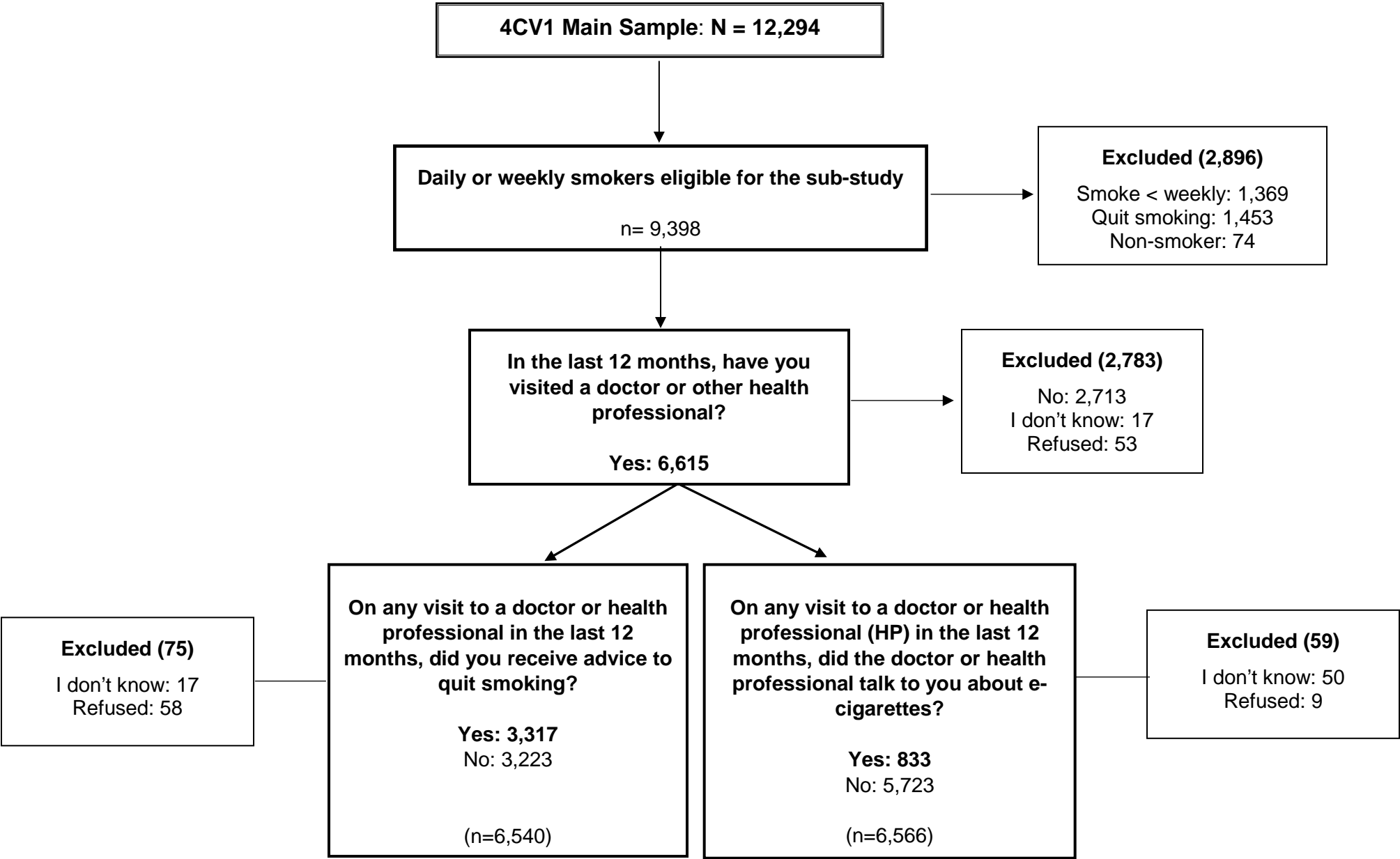


Figure 2. Health professional (HP) advice about vaping products (VPs) among smokers who had a discussion with a HP about VPs in the last year (n=831).

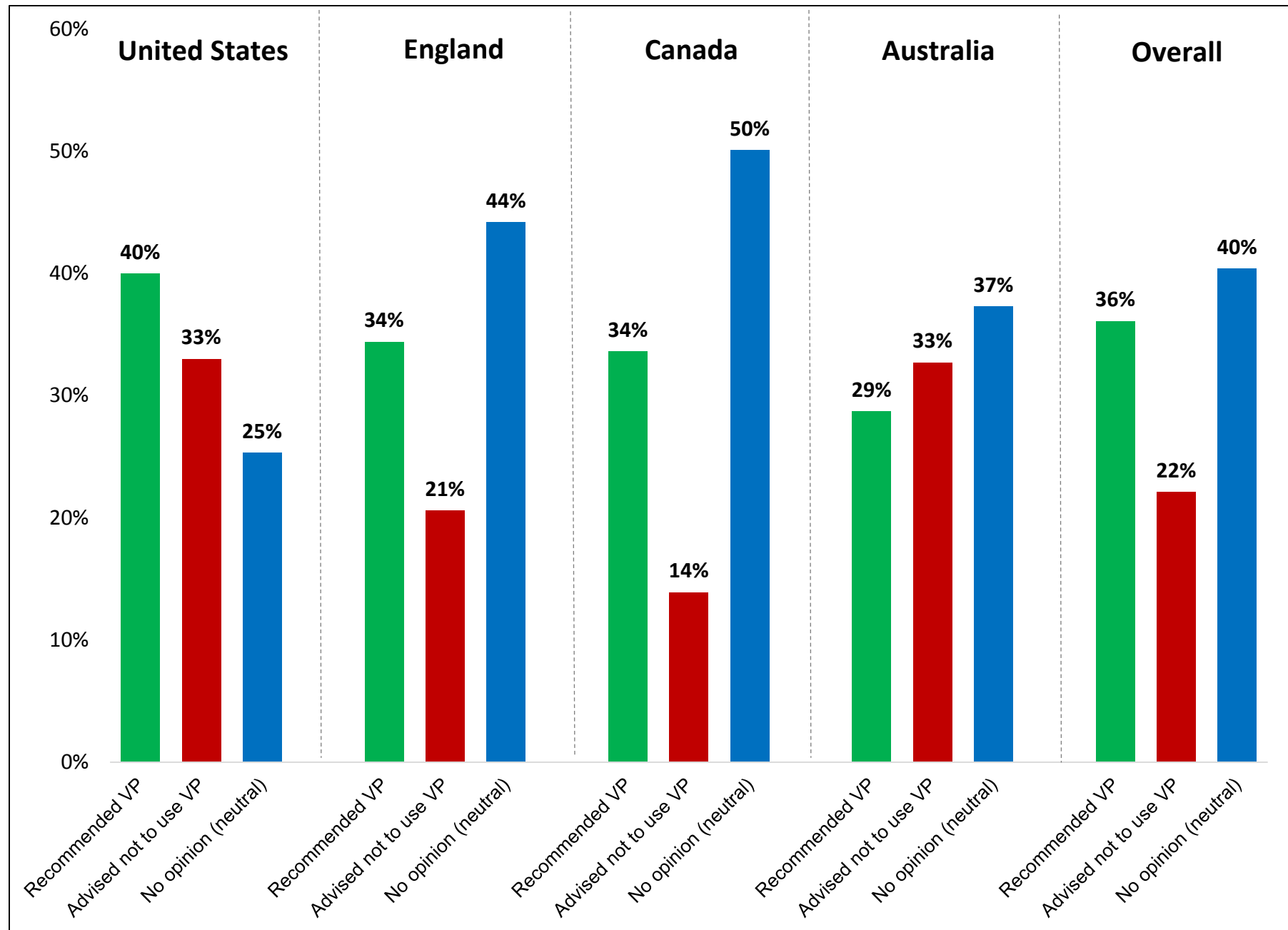


Table 1 Characteristics of the study sample (unweighted).

		<i>Australia</i>	<i>Canada</i>	<i>England</i>	<i>United States</i>	<i>Total Sample</i>
<i>Characteristic, n (%)</i>		<i>n = 1046 (15.8)</i>	<i>n = 1935 (29.2)</i>	<i>n = 2116 (32.0)</i>	<i>n = 1518 (23.0)</i>	<i>N = 6615</i>
Sex	Male	496 (47.4)	863 (44.6)	1071 (50.6)	757 (49.9)	3187(48.2)
	Female	550 (52.6)	1072 (55.4)	1045 (49.4)	761 (50.1)	3428(51.8)
Age	Mean age	51.1	43.8	43.7	45.8	45.4
Age group	18–24	23 (2.2)	368 (19.0)	435 (20.6)	300 (19.8)	1126(17.0)
	25–39	171 (16.4)	442 (22.8)	434 (20.5)	367 (24.2)	1414(21.4)
	40–54	397 (38.0)	564 (29.2)	586 (27.2)	238 (15.7)	1785(27.0)
	55+	455 (43.5)	561 (29.0)	661 (31.2)	613 (40.4)	2290(34.6)
Educational level	Low	356 (34.0)	586 (30.3)	631 (29.8)	458 (30.2)	2031(30.7)
	Moderate	420 (40.2)	871 (45.0)	866 (40.9)	578 (38.1)	2735(41.4)
	High	289 (24.8)	466 (24.1)	587 (27.7)	482 (31.8)	1794(27.1)
	No answer	11 (1.1)	12 (0.6)	32 (1.5)	0 (0.0)	55 (0.8)
Income	Low	228 (21.8)	441 (22.8)	501 (23.7)	476 (31.4)	1646(24.9)
	Moderate	271 (25.9)	297 (15.4)	636 (30.1)	375 (24.7)	1579(23.9)
	High	478 (45.7)	1060 (54.8)	814 (38.5)	652 (43.0)	3004(45.4)
	Not stated	69 (6.6)	137 (7.1)	165 (7.8)	15 (1.0)	386 (5.8)
Smoking status	Daily	999 (95.5)	1644 (85.0)	1835 (86.7)	1332 (87.8)	5810(87.8)
	Weekly	47 (4.5)	291 (15.0)	281 (13.3)	186 (12.3)	805 (12.2)
Addicted to cigarettes	Not at all	23 (2.2)	124 (6.4)	171 (8.1)	82 (5.4)	400 (6.1)
	Yes, somewhat	343 (32.8)	742 (38.4)	909 (43.0)	627 (41.3)	2621(39.6)
	Yes, very much	794 (64.4)	1048 (54.2)	1009 (47.7)	792 (52.2)	3523(53.3)
	Don't know	6 (0.6)	20 (1.0)	27 (1.3)	14 (0.9)	67 (1.0)
Ever tried to quit smoking	Yes	933 (89.2)	1661 (85.8)	1693 (80.0)	1229 (81.0)	5516(83.4)
Tried to quit smoking (≤ 12 months)	Yes	591 (56.5)	1182 (61.1)	1076 (50.9)	831 (54.8)	3680(55.7)
Intention to quit smoking	Within 1 month	139 (13.3)	247 (12.8)	265 (12.5)	219 (14.4)	870 (13.2)
	1–6 months	287 (27.4)	563 (29.1)	524 (24.8)	367 (24.2)	1741(26.3)
	Beyond 6 months	353 (33.8)	695 (35.9)	666 (31.5)	473 (31.2)	2187(33.1)
	No plan	153 (14.6)	232 (12.0)	463 (21.9)	290 (19.1)	1138(17.2)
	Don't know	114 (10.9)	196 (10.1)	195 (9.2)	166 (10.9)	671 (10.1)
E-cigarette use	Daily use	57 (5.5)	210 (10.9)	246 (11.6)	302 (19.9)	815 (12.3)
	Weekly use	50 (4.8)	264 (13.6)	189 (8.9)	236 (15.6)	739 (11.2)
	< weekly	39 (3.7)	152 (7.9)	203 (9.6)	89 (5.9)	483 (7.3)
	< monthly	122 (11.7)	434 (22.4)	444 (21.0)	170 (11.2)	1170(17.7)
	Not at all	248 (23.7)	311 (16.1)	437 (20.7)	355 (23.4)	1351(20.4)
E-cigarettes make quitting smoking easier or harder	Never tried	530 (50.7)	564 (29.2)	597 (28.2)	366 (24.1)	2057(31.1)
	A lot easier	127 (12.1)	251 (13.0)	291 (13.8)	222 (14.6)	891 (13.5)
	A bit easier	281 (26.9)	767 (39.6)	851 (40.2)	496 (32.7)	2395(36.2)
	No effect	190 (18.2)	359 (18.6)	408 (19.3)	299 (19.7)	1256(19.0)
	A bit harder	55 (5.3)	145 (7.5)	158 (7.5)	128 (8.4)	486 (7.4)
Opinion of vaping	A lot harder	34 (3.3)	69 (3.6)	79 (3.7)	64 (4.2)	246 (3.7)
	Don't know	351 (33.6)	330 (17.1)	318 (15.0)	297 (19.6)	1296(19.6)
	Very positive	38 (3.6)	57 (3.0)	74 (3.5)	144 (9.5)	313 (4.7)
	Positive	125 (12.0)	325 (16.8)	413 (19.5)	284 (18.7)	1147(17.3)
	No opinion	860 (40.9)	860 (44.4)	962 (45.5)	597 (39.3)	2847(43.0)
Harm: e-cigarettes compared to conventional cigarettes	Negative	172 (16.4)	406 (21.0)	381 (18.0)	271 (17.9)	1230(18.6)
	Very negative	67 (6.4)	120 (6.2)	165 (7.8)	100 (6.6)	452 (6.8)
	Don't know	208 (19.9)	151 (6.9)	109 (5.2)	105 (6.9)	573 (8.7)
	Much less	201 (19.2)	417 (21.6)	474 (22.4)	292 (19.2)	1384(20.9)
	Somewhat less	348 (33.3)	768 (39.7)	928 (43.9)	536 (35.3)	2580(39.0)
	Equally	173 (16.5)	412 (21.3)	352 (16.6)	376 (24.8)	1313(19.9)
	Somewhat more	19 (1.8)	58 (3.0)	65 (3.1)	55 (3.6)	197 (3.0)
	Much more	7 (0.7)	26 (1.3)	30 (1.4)	35 (2.3)	98 (1.5)
	Don't know	297 (28.4)	253 (13.1)	267 (12.6)	218 (14.4)	1035(15.7)

(Continues)

Table 1 (Continued)

		<i>Australia</i>	<i>Canada</i>	<i>England</i>	<i>United States</i>	<i>Total Sample</i>
<i>Characteristic, n (%)</i>		<i>n = 1046 (15.8)</i>	<i>n = 1935 (29.2)</i>	<i>n = 2116 (32.0)</i>	<i>n = 1518 (23.0)</i>	<i>N = 6615</i>
Public opinion of e-cigarettes	Strongly approves	6 (0.6)	26 (1.3)	23 (1.1)	75 (4.9)	130 (2.0)
	Somewhat approves	23 (2.2)	65 (3.4)	92 (4.4)	127 (8.4)	307 (4.6)
	Neither	112 (10.7)	183 (9.5)	323 (15.3)	182 (12.0)	800 (12.1)
	Somewhat disapproves	408 (39.0)	687 (35.5)	1017 (48.1)	492 (32.4)	2604 (39.4)
	Strongly disapproves	472 (45.1)	947 (48.9)	631 (29.8)	600 (39.5)	2650 (40.1)
	Don't know	24 (2.3)	26 (1.3)	30 (1.4)	38 (2.5)	118 (1.8)
Comorbidities (yes)	Depression	472 (45.1)	947 (48.9)	631 (29.8)	600 (39.5)	2650 (40.1)
	Anxiety	24 (2.3)	26 (1.3)	30 (1.4)	38 (2.5)	118 (1.8)
	Diabetes	300 (28.7)	446 (23.1)	572 (27.0)	389 (25.6)	1707 (25.8)
	Cancer	240 (22.9)	483 (25.0)	464 (21.9)	406 (26.8)	1593 (24.1)
	Lung disease	100 (9.6)	167 (8.6)	172 (8.1)	191 (12.6)	630 (9.5)

Data are unweighted. Row percentages are reported within country cells and total percentages are presented for the total sample that were eligible for the study and had complete data. Chronic lung disease/illness: asthma, emphysema or chronic bronchitis.

Table 2a Prevalence estimates of HP advice to quit smoking, discussions with an HP about NVPs, and the recommendation to use an NVP by an HP among smokers from four countries with differing NVP regulatory policies^b.

	<i>Prevalence estimates of HP advice to quit smoking (6540)</i>		<i>Prevalence estimates of NVP discussions with an HP (6566)</i>		<i>Prevalence estimates of NVP recommendations by an HP (6603)^a</i>	
	%	95% CI	%	95% CI	%	95% CI
Australia	50.4%	46.64–54.11	4.3	2.88–5.78	1.1	0.54–2.10
Canada	47.1%	44.48–49.75	7.8	6.49–9.13	2.4	1.77–3.25
England	39.5%	36.81–42.17	6.2	5.03–7.37	1.9	1.32–2.64
United States	58.3%	54.55–61.90	8.8	6.93–10.74	3.2	2.36–4.34
Total	47.5%	45.93–49.09	6.8	6.08–7.55	2.1	1.70–2.56
Country Comparisons			OR	95% CI	OR	95% CI
Canada versus Australia	–	–	1.87	1.26–2.78	2.28	1.06–4.87
England versus Australia	–	–	1.47	0.98–2.20	1.76	0.83–3.74
United States versus Australia	–	–	2.15	1.41–3.29	3.07	1.45–6.47

Australia is the reference country for comparisons for nicotine vaping product (NVP) discussions and recommendations because it has the strictest NVP regulatory policies and enforcement environment. CI = confidence interval; HP = health professional; NVP = nicotine vaping product; OR = odds ratio. ^aRespondents who reported that they did not have a discussion with a health professional were coded as 'not recommended an NVP/e-cigarette'. ^bThe data are based on smoking respondents who reported that they visited an HP in the last year (prior to the survey).

Table 2b Nicotine vaping product (e-cigarette) discussions, and their content, between health professionals and smokers within last year.

<i>Outcome</i>	<i>Australia (reference country)</i>	<i>Canada</i>	<i>England</i>	<i>United States</i>	<i>Overall</i>
On any visit to a doctor or health professional in the last 12 months, did the doctor or health professional talk to you about e-cigarettes? (<i>n</i> = 6566)					
Yes (<i>n</i> = 833)	4.3%	7.8%	6.2%	8.8%	6.8%
No (<i>n</i> = 5683)	95.2%	91.7%	92.8%	90.2%	92.5%
Don't know (<i>n</i> = 50)	0.5%	0.5%	1.0%	1.0%	0.7%
The last time you discussed e-cigarettes with a doctor or health professional, did you bring it up or did they? (<i>n</i> = 833)					
I brought it up (<i>n</i> = 463)	57.4%	57.9%	51.8%	49.5%	54.0%
HP brought it up (<i>n</i> = 355)	39.9%	40.4%	47.2%	50.1%	45.0%
Don't know (<i>n</i> = 15)	2.7%	1.7%	1.0%	0.3%	1.0%
What advice did the doctor or health professional give you about e-cigarettes? (<i>n</i> = 831)^a					
HP recommended that I use e-cigarettes (<i>n</i> = 350)	28.7%	33.6%	34.4%	40.0%	36.1%
HP advised me against using e-cigarettes (<i>n</i> = 197)	32.7%	13.9%	20.6%	33.0%	22.1%
HP didn't express a view for or against e-cigarettes (<i>n</i> = 274)	37.3%	50.1%	44.2%	25.3%	40.4%
Don't know (<i>n</i> = 10)	1.3%	2.4%	0.8%	1.7%	1.5%
Within-country ratio comparisons (among patients who had a discussion with their HP about e-cigarettes, <i>n</i> = 831^a)					
Favorable e-cigarette opinion ratio: recommend e-cigarettes versus advised against use of e-cigarettes	0.88 (28.7/32.7)	2.41 (33.6/13.9)	1.67 (34.4/20.6)	1.21 (40.0/33.0)	1.63 (36.1/22.1)
Opinion (recommend versus not recommend) versus no opinion	1.6 (61.4/37.3)	0.95 (47.5/50.1)	1.24 (55.0/44.2)	2.89 (73.0/25.3)	1.44 (58.2/40.4)

Data are weighted; Estimates control for sex, age and country. 'Don't know' responses were included in the 'No' response options for comparisons for the outcome: discussion about e-cigarettes (no discussion) and as 'HP didn't express a view for or against e-cigarettes' for the outcome advice about using e-cigarettes, and were excluded for the outcome 'who raised the topic (*n* = 15)'. ^aTwo respondents refused to answer the question about HP e-cigarette recommendation and were excluded.

Table 3 Model 1: Adjusted logistic regression analyses examining smoker's characteristics associated with a discussion about NVPs with a health professional, and with a recommendation to use an NVP.

Model 1a: talked to a health professional about NVPs (e-cigarettes) (n = 6385) Yes (n = 802) versus no (5583)						Model 1b: received advice to use an NVP (e-cigarette)(n = 6383) Yes (n = 333) versus no/no opinion/no discussion (n = 6050)				
Variables	%	95% CI				%	95% CI			
		OR	Lowerbound	Upper bound	P-value		OR	Lower bound	Upper bound	P-value
Country										
Canada	3.1%	2.41	1.55	3.75	< 0.001	0.5%	3.25	1.69	6.25	< 0.001
England	2.8%	2.22	1.42	3.47	< 0.001	0.3%	2.09	1.05	4.17	0.037
United States	3.6%	2.82	1.75	4.55	< 0.0001	0.7%	4.06	2.04	8.08	< 0.0001
Australia	1.3%	Reference				0.2%	Reference			
Sex										
Male	3.6%	1.75	1.35	2.27	< 0.0001	0.5%	1.36	0.90	2.04	0.142
Female	2.1%	Reference				0.3%	Reference			
Age (years)										
18–24	4.7%	2.58	1.67	3.98	< 0.0001	1.0%	4.96	2.36	10.42	< 0.0001
25–39	3.4%	1.82	1.22	2.71	0.003	0.5%	2.47	1.29	4.73	0.006
40–54	2.8%	1.51	1.05	2.17	0.027	0.5%	2.34	1.21	4.54	0.012
55+	1.9%	Reference				0.2%	Reference			
Educational level										
Low	2.5%	0.56	0.39	0.80	0.001	0.4%	0.60	0.36	1.00	0.048
Moderate	2.4%	0.52	0.39	0.70	< 0.0001	0.3%	0.48	0.31	0.76	0.002
Not stated	6.0%	1.37	0.40	4.68	0.611	2.0%	3.08	0.52	18.36	0.216
High	4.5%	Reference				0.7%	Reference			
Income										
Low	2.5%	0.79	0.55	1.13	0.198	0.3%	0.51	0.29	0.88	0.015
Moderate	2.6%	0.84	0.60	1.19	0.337	0.4%	0.77	0.46	1.30	0.335
Not stated	1.8%	0.58	0.29	1.14	0.114	0.2%	0.42	0.14	1.27	0.124
High	3.1%	Reference				0.5%	Reference			
Smoking status										
Daily	2.6%	0.73	0.49	1.08	0.114	0.4%	1.49	0.78	2.82	0.225
Weekly	3.6%	Reference				0.3%	Reference			
Addicted to cigarettes										0.968
Yes	2.9%	2.01	1.24	3.25	0.005	0.4%	1.01	0.58	1.75	
somewhat/ very much										
Not at all	1.4%	Reference				0.4%	Reference			
Attempted to quit smoking in the last 12 months										
Yes	2.8%	1.03	0.68	1.57	0.884	0.4%	0.92	0.47	1.79	0.804
No	2.7%	Reference				0.4%	Reference			
Intention to quit smoking										
≤6 months	3.5%	1.53	1.17	2.02	0.002	0.4%	1.03	0.69	1.53	0.885
> 6 months/ no plan	2.3%	Reference				0.4%	Reference			
Received advice by HP to quit smoking										
Yes	8.4%	9.30	6.36	13.60	< 0.0001	1.5%	12.11	6.59	22.28	< 0.0001
No/don't know	1.0%	Reference				0.1%	Reference			
E-cigarette use										
Daily	10.4%	5.44	3.72	7.95	< 0.0001	1.5%	4.24	2.41	7.45	< 0.0001
Weekly	8.7%	4.47	3.02	6.64	< 0.0001	0.7%	2.02	1.12	3.66	0.020
< Weekly	3.1%	1.48	1.04	2.10	0.029	0.3%	0.96	0.53	1.74	0.898
Not at all/ never tried	2.1%	Reference				0.4%	Reference			

(Continues)

Table 3 (Continued)

Model 1a: talked to a health professional about NVPs (e-cigarettes) (n = 6385) Yes (n = 802) versus no (5583)						Model 1b: received advice to use an NVP (e-cigarette) (n = 6383) Yes (n = 333) versus no/no opinion/no discussion (n = 6050)				
Variables	%	OR	95% CI			%	OR	95% CI		
			Lower bound	Upper bound	P-value			Lower bound	Upper bound	P-value
NVPs make quitting smoking easier or harder										
At least a bit easier	3.4%	1.12	0.79	1.59	0.524	0.6%	1.65	0.95	2.87	0.075
Don't know	1.5%	0.47	0.29	0.77	0.003	0.2%	0.44	0.13	1.49	0.186
No effect/harder	3.1%	Reference				0.4%	Reference			
Opinion of vaping										
Positive	4.3%	1.93	1.39	2.69	<0.0001	0.9%	3.31	1.99	5.52	< 0.0001
Don't know	5.3%	2.38	1.22	4.65	0.011	1.4%	4.80	1.25	18.39	0.022
No opinion/negative	2.3%	Reference				0.3%	Reference			
Harm: NVPs compared to regular cigarettes										
Less harmful	2.2%	0.55	0.38	0.80	0.002	0.4%	1.38	0.77	2.44	0.277
Don't know	3.3%	0.83	0.46	1.52	0.546	0.8%	2.78	0.97	7.94	0.057
Equally harmful/more harmful	3.9%	Reference				0.3%	Reference			
NVPs effect on health										
Improve (a lot/little)	3.1%	1.09	0.71	1.68	0.684	0.4%	1.15	0.63	2.12	0.649
Don't know	1.9%	0.67	0.38	1.17	0.155	0.3%	0.81	0.34	1.93	0.628
No effect/worsen	2.8%	Reference				0.4%	Reference			
Public's opinion about NVPs										
Approve	4.1%	1.52	1.12	2.07	0.008	1.1%	2.47	1.54	3.97	< 0.001
Don't know	1.7%	0.62	0.35	1.09	0.096	0.1%	0.21	0.06	0.77	0.019
Neither approve or disapprove	2.7%	Reference				0.4%	Reference			
Depression										
Yes	3.0%	1.15	0.82	1.62	0.414	0.5%	1.40	0.87	2.26	0.166
No	2.6%	Reference				0.4%	Reference			
Anxiety										
Yes	2.1%	0.69	0.48	1.00	0.048	0.2%	0.48	0.29	0.81	0.006
No	3.0%	Reference				0.5%	Reference			
Diabetes										
Yes	4.4%	1.75	1.07	2.85	0.026	0.7%	1.78	0.93	3.40	0.080
No	2.6%	Reference				0.4%	Reference			
Cancer										
Yes	6.7%	2.61	1.18	5.77	0.018	0.2%	0.48	0.14	1.69	0.254
No	2.7%	Reference				0.4%	Reference			
Lung disease										
Yes	3.5%	1.33	0.85	2.07	0.214	0.8%	2.02	1.09	3.73	0.026
No	2.7%	Reference				0.4%	Reference			

'Don't know' responses were included in the 'No' response options for some variables. OR = odds ratio; CI = confidence interval; NVP = nicotine vaping product.

Supplemental Figure 1. Summary and depiction of the general level of national nicotine vaping products (NVP) regulatory policies for the sale and marketing of e-cigarettes that were in place prior to and during data collection for this study (July to November 2016).

Most restrictive NVP regulatory policies with strong enforcement

- Illegal to sell NVPs; this law is strongly enforced.
- NVPs are not widely available in retail stores.

Australia

- The possession/use of NVPs without a prescription is banned throughout Australia. One state (Western Australia) has banned the sale of all vaping devices regardless of nicotine content. Many jurisdictions apply similar restrictions on public vaping as for smoking.

- *Therapeutic Goods Administration, 2017*

Restrictive NVP regulatory policies with weak enforcement

- NVPs not approved for sale, but are widely available (including in specialty retail locations) due to weak enforcement of the law.

Canada

- Vaping device manufacturers not permitted to make cessation or medical/ therapeutic claims. Over the past decade vaping specialty stores have increased their selection of devices and e-liquids with a range nicotine strengths. Advertising NVPs not permitted, although not strongly enforced.

- *Health Canada, November 2016*

Less restrictive NVP regulatory policies

- Legal to sell NVPs in several retail locations, with country-specific regulations.

England*

United States**

*England: Cross border NVP advertising banned, but local advertising permitted, including: *outdoor billboards/posters, public transport posters, point of sale, leaflets, and direct mail*. Local advertisements were required to meet the following criteria:

- should not appeal to children/youth,
- should be socially responsible,
- should not show images that look like ordinary cigarettes, and
- not permitted to make cessation claims or medical/ therapeutic claims.
- NVP labels must follow EU chemical labelling laws.

- *UK Tobacco and Related Products Regulations 2016*

**US: NVP advertising and sales permitted in all channels.

- Labeling and advertisements not permitted to make cessation claims or other medical/therapeutic claims. Although this requirement was not strictly enforced, none of the major companies selling NVPs explicitly made such claims, or any other harm-reduction claims, in labeling or advertising.
- Although some new requirements and restrictions were applied to NVPs in August 2016, shortly before the end of the study time period, these did not significantly change pre-existing NVP marketing or sales practices.

- *FDA Deeming Rule, effective August 8, 2016*